

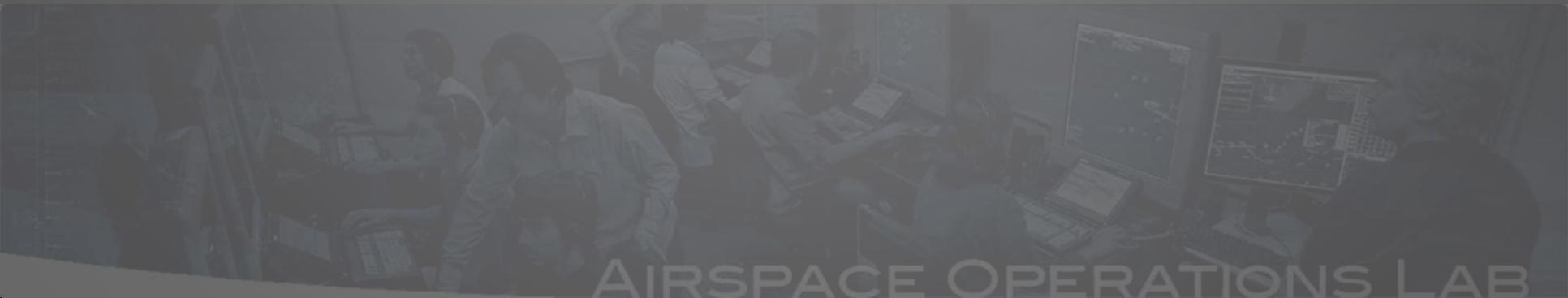


San José State
UNIVERSITY



Scenario Generation in MACS

Jeff Homola



Outline

- Introduction
- Traffic scenario generation
 - Getting started
 - AC Table Editor
 - Scenario Editor
- Going forward and final notes

Scenario Generation

- The scenario generation and editing functions in MACS are the primary means by which traffic scenarios are created for use in simulations and testing
- The scenario generation tools allow for a great deal of flexibility in what can be tested
- To date, a variety of traffic situations have been created that simulated current day operations both in the terminal and en route domains as well as far-term environments with 2-3 times current traffic levels and different levels of aircraft equipage

Typical questions that guide the process

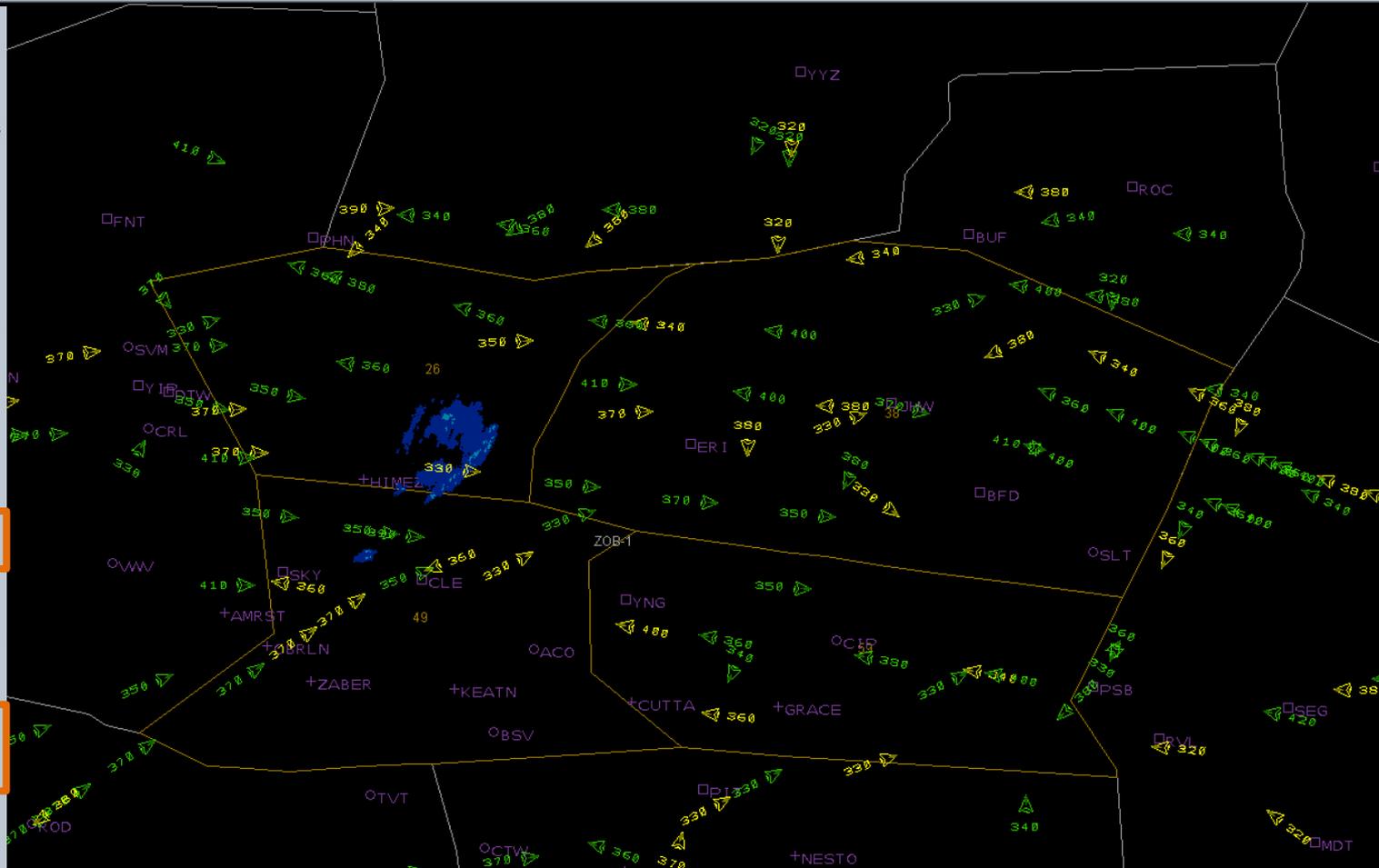
- What is the airspace of concern?
- What are the targeted traffic loads for that airspace?
- What is the duration and scope of the problem?
- What are the equipage assumptions?
- How structured does the traffic need to be?
- What, if any, are the desired interactions of the traffic?

Setup

MACS Scenario Editor -- Configuration: Center

File Edit Display Tags MouseTools Tools Help Traj Flown Traj Tags Drag Ac WxAc C:\Experiments\Corridors\MacsScenarios\SimTraffic\EinC_High_S1.txt

- ATC DST Configuration
- ATC DST Configuration Sector
- Aircraft Crossing History Setup
- Aircraft Flight State History Setup
- DSR_1
- Data Collection Setup
- ERAM Data Tag Rules Setup
- ERAM PlanViewSetup
- ERAM SectorPlanViewSetup
- ERAM Timeline Setup
- ERAM Waypoint Setup
- Event Control
- Flight Deck Setup
- MACS Windows Setup
- MacsComm Setup
- Master configuration setup
- Property Items setup
- SA Probes
- SCENARIO_EDITOR PlanViewSetup
- SCENARIO_EDITOR SectorPlanViewSetup
- STARS Data Tag Rules Setup
- STARS PlanViewSetup
- STARS SectorPlanViewSetup
- STARS Timeline Setup
- STARS Waypoint Setup
- ScenarioEditor Data Tag Rules Setup
- ScenarioEditor Setup
- ScenarioEditor Waypoint Setup
- Scheduler Setup
- Scripting Setup
- Simulation

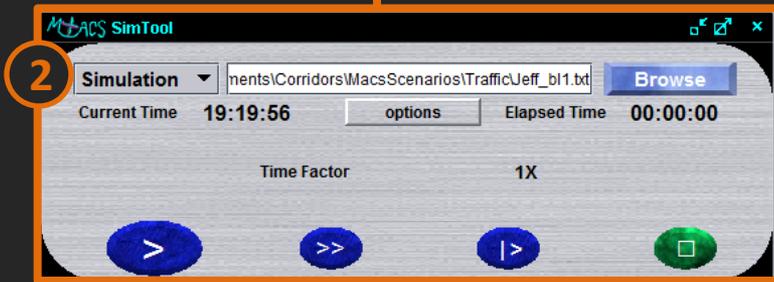


Traffic

- Base traffic can come from a variety of sources
- Often requires cleanup and some interpolation
- Does not need to come from alternate source

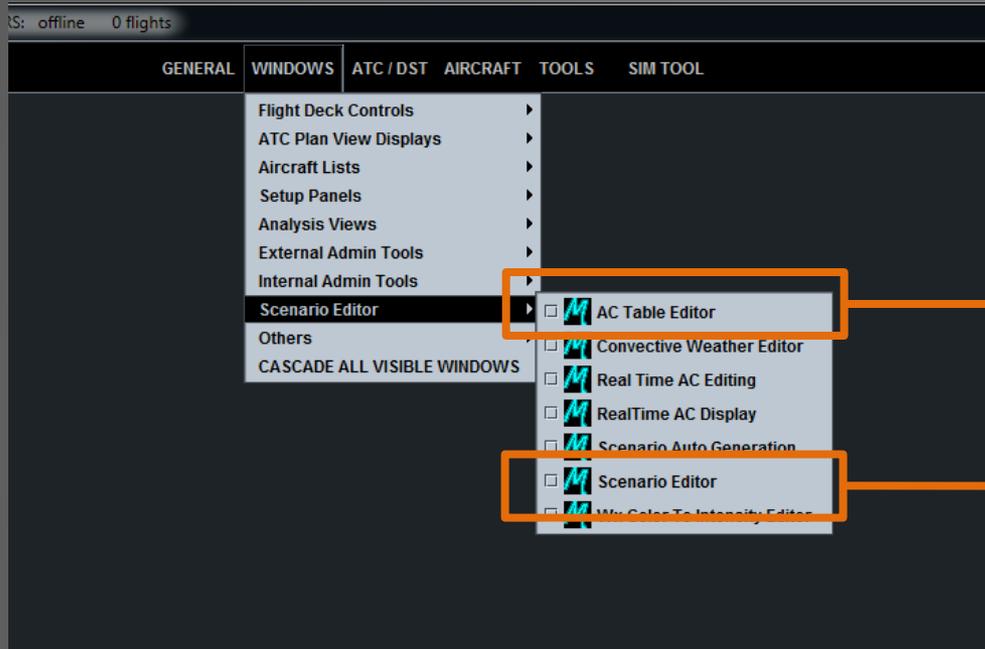
callsign	timeToEnter	altitude	cruiseAltitude	altitudeTarget	departureAi	destination...	filedRoute	route	startPointN...	targetWayp...	indicatedAir...	speedTarget	cruiseSpeed	mach	flightRules	inMach	clasSectorid	acSectorid	atcType	inVnav	inLnav	isCpdlEqui...	isAdsEquip...
UAL536	0	39000.0	39000.0	39000.0	ORD	LGA	ORD / ADI...	ORD / ADI...	412240N0...	MIGET	237.62642	0.75937474	0.75937474	0.76999999	TFR	true	ZOB_59	ZOB_59	A319	true	true	true	true
UAL6	0	39000.0	39000.0	39000.0	SFO	JFK	SFO / KG7...	.KG75M.D...	423001N0...	KG75M	245.07034	0.7916729	0.7916729	0.791681	TFR	true	ZOB_66	ZOB_66	B752	true	true	true	true
UAL604	0	12695.619	37000.0	37000.0	ORD	DCA	ORD / OTE...	.OTENS.A...	415604N0...	OTENS	211.4997	0.7448694	0.7448694	0.40342212	TFR	false	ZOB_66	ZOB_66	A319	true	true	true	true
UAL661	0	13792.179	38000.0	38000.0	LGA	ORD	LGA / COA...	.COATE.J3...	410104N0...	COATE	241.0527	0.7578999	0.7578999	0.46841636	TFR	false	ZOB_66	ZOB_66	A320	true	true	true	true
UAL667	0	38000.0	38000.0	38000.0	LGA	ORD	LGA / COA...	LGA / COA...	414259N0...	REBBL	246.72119	0.7521466	0.7521466	0.78	TFR	true	ZOB_66	ZOB_66	A319	true	true	true	true
UAL672	0	11300.0	39000.0	39000.0	ORD	LGA	ORD / ADI...	.ADIME.G...	415851N0...	ADIME	206.43047	0.75937474	0.75937474	0.38379288	TFR	true	ZOB_66	ZOB_66	A319	true	true	true	true
UAL680	0	700.0	39000.0	39000.0	ORD	LGA	ORD / ADI...	.ADIME.G...	415851N0...	ADIME	0.0	250.0	0.75937474	0.0	TFR	false	ZOB_66	ZOB_66	A319	true	true	true	true
UAL698	0	23000.0	39000.0	39000.0	ORD	PVD	ORD / HAA...	.HAAKK.D...	420320N0...	HAAKK	251.80535	0.688	0.75937474	0.5896367	TFR	true	ZOB_66	ZOB_66	A319	true	true	true	true
UAL756	0	38000.0	38000.0	38000.0	LGA	ORD	LGA / STW...	LGA / STW...	421442N0...	BEWEL	237.0	0.7521466	0.7521466	0.7521466	TFR	true	ZOB_79	ZOB_79	A319	true	true	true	true
UAL773	0	38000.0	38000.0	38000.0	LGA	ORD	LGA / STW...	LGA / STW...	414946N0...	HDXIE	237.0	0.7521466	0.7521466	0.7521466	TFR	true	ZOB_79	ZOB_79	A319	true	true	true	true
UAL874	0	22000.0	38000.0	38000.0	LGA	ORD	LGA / STW...	.STW.J70...	404940N0...	STW	279.99997	242.0	0.7521466	0.63761446	TFR	true	ZOB_66	ZOB_66	A319	true	true	true	true
UPS2049	0	18000.0	34000.0	34000.0	MHT	SDF	MHT / PSB...	.PSB.APE...	423457N0...	PSB	228.72181	0.7990948	0.7990948	0.48856478	TFR	false	ZOB_66	ZOB_66	B752	true	true	true	true
VRD012	0	37000.0	37000.0	37000.0	SFO	JFK	SFO / KG7...	.KG75M.D...	423032N0...	KG75M	242.22469	0.75051314	0.75051314	0.7511465	TFR	true	ZOB_66	ZOB_66	A320	true	true	true	true
VRD203	0	34000.0	34000.0	34000.0	YYZ	SFO	YYZ / CEF...	.CRL.RBS...	425157N0...	CRL	258.34814	0.73379546	0.73379546	0.7479774	TFR	true	ZOB_26	ZOB_26	A320	true	true	true	true
WJA1147	0	36000.0	36000.0	36000.0	FLL	YYZ	FLL / DKK...	.DKK.LIN...	374905N0...	DKK	241.24628	0.7403725	0.7403725	0.7483875	TFR	true	ZOB_66	ZOB_66	B737	true	true	true	true
WJA1169	0	39000.0	39000.0	39000.0	MCO	YYZ	MCO / EKN...	.DKK.LIN...	393126N0...	DKK	234.0	0.75937474	0.75937474	0.75937474	TFR	true	ZOB_66	ZOB_66	B737	true	true	true	true
WJA1278	0	38000.0	38000.0	38000.0	YOW	MCO	YOW / PSB...	.YOW / PSB...	404829N0...	LOONS	237.0	0.7521466	0.7521466	0.7521466	TFR	true	ZOB_59	ZOB_59	B737	true	true	true	true
UAL679	20	0.0	38000.0	38000.0	LGA	ORD	LGA / COA...	.COATE.J3...	404637N0...	COATE	0.0	250.0	0.7521466	0.0	TFR	false	ZOB_66	ZOB_66	A319	true	true	true	true
WJA1920	266	0.0	40000.0	40000.0	YYZ	MSY	YYZ / THO...	.THORL.E...	434038N0...	THORL	0.0	225.85341	0.76654875	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
UAL678	292	700.0	37000.0	37000.0	ORD	LGA	ORD / ADI...	.ADIME.G...	415851N0...	ADIME	0.0	250.0	0.7448694	0.0	TFR	false	ZOB_66	ZOB_66	A319	true	true	true	true
UAL674	480	700.0	39000.0	39000.0	ORD	LGA	ORD / ADI...	.ADIME.G...	415851N0...	ADIME	0.0	200.0	0.75937474	0.0	TFR	false	ZOB_66	ZOB_66	A319	true	true	true	true
WJA2536	642	0.0	36000.0	36000.0	YYZ	MUSC	YYZ / THO...	.THORL.J...	434038N0...	THORL	0.0	235.03288	0.7403725	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
UAL673	758	0.0	38000.0	38000.0	LGA	ORD	LGA / COA...	.COATE.J3...	404637N0...	COATE	0.0	200.0	0.7521466	0.0	TFR	false	ZOB_66	ZOB_66	A319	true	true	true	true
UAL638	1049	700.0	37000.0	37000.0	ORD	EWR	ORD / HAA...	.HAAK.D...	415851N0...	HAAKK	0.0	250.0	0.75051314	0.0	TFR	false	ZOB_66	ZOB_66	A320	true	true	true	true
UAL549	1058	0.0	36000.0	36000.0	PHL	ORD	PHL / RAV...	.RAV.J64...	395220N0...	RAV	0.0	250.0	0.7459039	0.0	TFR	false	ZOB_66	ZOB_66	A320	true	true	true	true
WJA2650	1100	0.0	38000.0	38000.0	YYZ	MMPR	YYZ / ANC...	.ANCOL.Y...	434038N0...	ANCOL	0.0	250.0	0.7521466	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
WJA2624	1376	0.0	37000.0	37000.0	YYZ	MUHG	YYZ / THO...	.THORL.J...	434038N0...	THORL	0.0	203.37582	0.74769264	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
WJA2668	1443	0.0	37000.0	37000.0	YYZ	MBPV	YYZ / THO...	.THORL.J...	434038N0...	THORL	0.0	220.56451	0.74769264	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
UAL610	1811	700.0	39000.0	39000.0	ORD	DCA	ORD / TOP...	.TOPHR.A...	415851N0...	TOPHR	0.0	250.0	0.7623088	0.0	TFR	false	ZOB_66	ZOB_66	A320	true	true	true	true
UAL608	2086	700.0	39000.0	39000.0	ORD	DCA	ORD / OTE...	.OTENS.A...	415851N0...	OTENS	0.0	250.0	0.75937474	0.0	TFR	false	ZOB_66	ZOB_66	A319	true	true	true	true
WJA1244	2089	0.0	38000.0	38000.0	YYZ	TPA	YYZ / THO...	.THORL.E...	434038N0...	THORL	0.0	225.71767	0.7521466	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
WJA1232	2289	0.0	38000.0	38000.0	YYZ	FLL	YYZ / THO...	.THORL.E...	434038N0...	THORL	0.0	229.57602	0.7521466	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
WJA2754	2402	0.0	39000.0	39000.0	YYZ	MYNN	YYZ / THO...	.THORL.J...	434038N0...	THORL	0.0	220.0454	0.75937474	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
WJA1140	2517	0.0	38000.0	38000.0	YYZ	MIA	YYZ / THO...	.THORL.E...	434038N0...	THORL	0.0	224.72813	0.7521466	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
WJA576	2669	400.0	38000.0	38000.0	YOW	MCO	YOW / PSB...	.PSB.J78...	451920N0...	PSB	0.0	250.0	0.7521466	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
WJA2506	2743	0.0	37000.0	37000.0	YYZ	MDPC	YYZ / THO...	.THORL.J...	434038N0...	THORL	0.0	220.83073	0.74769264	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true
WJA2728	2844	0.0	39000.0	39000.0	YYZ	MDLR	YYZ / THO...	.THORL.J...	434038N0...	THORL	0.0	226.4078	0.75037474	0.0	TFR	false	ZOB_66	ZOB_66	B737	true	true	true	true

Getting Started



- 1 MACS initializes in Simulation mode by default. Editing can only be done in the Editor mode. To switch modes, first enable the SimTool by clicking on its item in the title bar.
- 2 Click on the SimTool's drop-down menu that is currently set to Simulation.
- 3 Select Editor from the menu to enter the Editing mode.

Common Tools



The screenshot shows the AC Table Editor spreadsheet. The table has columns for Design, Altitude, Speed, and other parameters. The data is organized in a grid format. Two orange boxes highlight the 'Scenario Editor' and 'AC Table Editor' options from the menu.



- The two most common tools used for traffic development and editing are the AC Table Editor spreadsheet and the graphical Scenario Editor.
- They are often used in tandem and interface with one another, so it is useful to have them both up together.

AC Table Editor

The screenshot shows the MACS AC Table Editor application window. The title bar reads 'MACS AC Table Editor'. The menu bar includes 'File', 'Edit', 'Tools', and 'Help 510/1', with a checked 'Propagate Edits' option. The main window contains a spreadsheet with columns for flight details. Above the spreadsheet, there are input fields for 'callsign' (ACA664), 'route' (..POSTS..PADDE..SVM..YXU..YWT..YYZ), and 'filedRoute' (ORD./POSTS..PADDE..SVM..YXU..YWT..YYZ). A 'Search' button is also present. The spreadsheet has 20 columns: callsign, timeToEnter, comment, altitude, cruiseAltitude, altitudeTarget, departureAi..., destination..., filedRoute, route, startPointN..., targetWayp..., indicatedAir..., speedTarget, cruiseSpeed, mach, flightRules, inMach, clasSectorId, acSectorId, atcType, type, and lat. The data rows show various flight paths and parameters, such as JZ7653, COM1798, ACA502, GJS7378, ACA664, EGF3759, N599DP, AAL90, AAL699, TRS583, AJI9462, AWE1951, SGB3805, COA1702, ACA797, ACA576, and ACA799.

callsign	timeToEnter	comment	altitude	cruiseAltitude	altitudeTarget	departureAi...	destination...	filedRoute	route	startPointN...	targetWayp...	indicatedAir...	speedTarget	cruiseSpeed	mach	flightRules	inMach	clasSectorId	acSectorId	atcType	type	lat
JZ7653	2982		0.0	33000.0	33000.0	DCA	YUL	DCA7/DLW...	ULW..SYR	385106N/0...	DLW	0.0	250.0	0.7679814	0.0	TFR	false	ZOB_66	ZOB_66	CRJ1	CRJ1	38.95...
COM1798	3181		700.0	33000.0	33000.0	ORD	BED	ORD./HAA...	..HAAKK..D...	415851N/0...	HAAKK	0.0	250.0	0.7679814	0.0	TFR	false	ZOB_66	ZOB_66	CRJ1	CRJ1	41.98...
ACA502	150		700.0	33000.0	33000.0	ORD	YYZ	ORD./POS...	..POSTS..P...	415851N/0...	POSTS	0.0	250.0	0.7679814	0.0	TFR	false	ZOB_66	ZOB_66	E170	E170	41.98...
GJS7378	3037		700.0	33000.0	33000.0	ORD	YYZ	ORD./POS...	..POSTS..P...	415851N/0...	POSTS	0.0	250.0	0.7679814	0.0	TFR	false	ZOB_66	ZOB_66	CRJ7	CRJ7	41.98...
ACA664	3233		700.0	33000.0	33000.0	ORD	YYZ	ORD./POS...	..POSTS..P...	415851N/0...	POSTS	0.0	250.0	0.7679814	0.0	TFR	false	ZOB_66	ZOB_66	E170	E170	41.98...
EGF3759	0		33000.0	33000.0	33000.0	ORD	YYZ	ORD./POS...	..POSTS..P...	420956N/0...	POSTS	285.70007	0.7679814	0.7679814	0.80304193	TFR	true	ZOB_66	ZOB_66	CRJ7	CRJ7	42.16...
N599DP	0		33000.0	33000.0	33000.0	YXU	ILG	YXU./PSB...	..PSB..ILG	414303N/0...	PSB	280.82324	0.7679814	0.7679814	0.790608	TFR	true	ZOB_79	ZOB_79	WW24	WW24	41.71...
AAL90	0		33000.0	33000.0	33000.0	ORD	EGLL	ORD./POS...	..YXU.J586...	423206N/0...	YXU	274.0	0.77312505	0.77312505	0.77312505	TFR	true	ZOB_26	ZOB_26	B763	B763	42.53...
AAL699	2251		700.0	33000.0	33000.0	ORD	EGLL	ORD./POS...	..POSTS..P...	415851N/0...	POSTS	0.0	250.0	0.77312505	0.0	TFR	false	ZOB_66	ZOB_66	B763	B763	41.98...
TRS583	1210		100.0	34000.0	34000.0	BWI	GRR	BWI./BUFF...	..BUFFR.J5...	391030N/0...	BUFFR	0.0	250.0	0.71780634	0.0	TFR	false	ZOB_66	ZOB_66	B712	B712	39.17...
AJI9462	2886		1200.0	34000.0	34000.0	UNV	SWO	UNV./AIR..F...	..UNV..AIR...	405057N/0...	UNV	0.0	250.0	0.71780634	0.0	TFR	false	ZOB_66	ZOB_66	B732	B732	40.84...
AWE1951	0		34000.0	34000.0	34000.0	BUF	CLT	BUF./JHW...	..EWC.J14...	410029N/0...	EWC	251.58502	0.72314525	0.72314525	0.7300322	TFR	true	ZOB_59	ZOB_59	B734	B734	41.00...
SGB3805	3174		600.0	34000.0	34000.0	IAG	PBI	IAG./PSB.J...	..PSB.J78.L...	430626N/0...	PSB	0.0	191.256	0.72314525	0.0	TFR	false	ZOB_14	ZOB_14	B734	B734	43.10...
COA1702	2569		0.0	34000.0	34000.0	EWR	SFO	EWR./LAR...L...	..LARRI.J8...	404133N/0...	LARRI	0.0	250.0	0.728475	0.0	TFR	false	ZOB_66	ZOB_66	B738	B738	40.69...
ACA797	0		34000.0	34000.0	34000.0	YUL	LAX	YUL./SYR...	..SYR.J29.J...	432300N/0...	SYR	252.85619	0.728475	0.728475	0.73341316	TFR	true	ZOB_66	ZOB_66	A319	A319	43.38...
ACA576	2813		0.0	34000.0	34000.0	YYZ	LAX	YYZ./ANC...	..ANCOL.Y...	434038N/0...	ANCOL	0.0	250.0	0.728475	0.0	TFR	false	ZOB_66	ZOB_66	A319	A319	43.67...
ACA799	0		11000.0	34000.0	34000.0	YYZ	LAX	YYZ./ANC...	..ANCOL.Y...	432028N/0...	ANCOL	246.1021	0.728475	0.728475	0.453047	TFR	false	ZOB_66	ZOB_66	A319	A319	43.34...

- The AC Table Editor displays the loaded traffic file as a spreadsheet and can be used as such.
- To load a file, simply go to **File** → **Open**, which will open a browser for file selection.
- Once loaded, the columns of values can be arranged according to preference by clicking and dragging the heading cell of a column to its desired location. This is a useful feature as it is often helpful to group certain columns together for review.

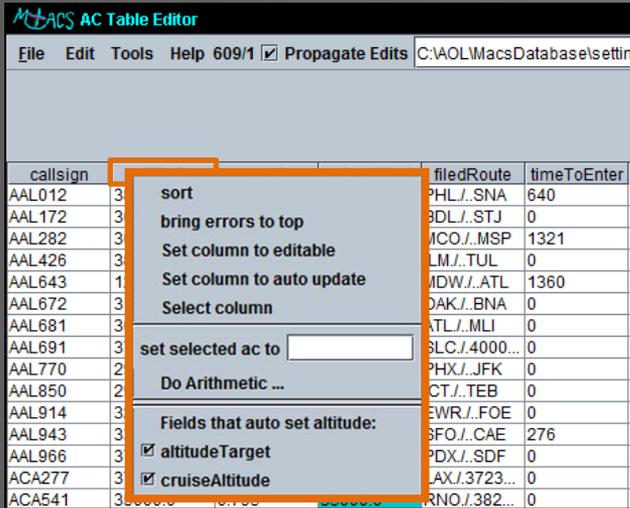
AC Table Editor

The screenshot shows the MACS AC Table Editor interface. The main window displays a table of aircraft data. The row for call sign 'COA569' is highlighted in bold. Above the table, three text boxes show the details for the selected row: 'callsign' is 'COA569', 'route' is '..KEEHO.J584.SLT.FQM1.EWR', and 'filedRoute' is 'LAS./KG720..KC72Q..KEEHO.J584.SLT.FQM1.EWR'. A search box is also visible.

callsign	timeToEnter	comment	altitude	callsign	deTarget	departureAi...	destination...	filedRoute	route	startPointN...	targetWayp...	indicatedAir...	speedTarget	cruiseSpeed	mach	flightRules	inMach
AAL1210	0		29000.0		00.0	ORD	BOS	ORD./POS...	..POSTS.P...	421200N/0...	POSTS	269.9019	0.73575485	0.73575485	0.6963478	TFR	true
TCF242	0		29000.0		00.0	CMH	LGA	CMH./HL...	..HLG.ETG...	400730N/0...	HLG	273.1786	0.7815279	0.7815279	0.70529145	TFR	true
SWA1043	0		31000.0		35000.0	MDW	BUF	MDW./EVO...	..EVOTE.N...	415539N/0...	EVOTE	274.57928	0.73575485	0.73575485	0.7489787	TFR	true
BTA2144	0	C	33000.0		35000.0	CMH	EWR	CMH./DJB...	..DORET.J...	412700N/0...	DORET	257.6433	0.73846704	0.73846704	0.7308041	IFR	true
TRS894	0		33000.0		35000.0	IND	LGA	IND./ROD...	..IND./ROD...	401905N/0...	PROTN	234.27844	0.722157	0.722157	0.66934574	TFR	true
TCF5940	0	C	33000.0		35000.0	ORD	LGA	ORD./ADI...	..ADIME.G...	415748N/0...	ADIME	274.25797	0.7815279	0.7815279	0.7626687	IFR	true
COA569	0		35000.0		35000.0	LAS	EWR	LAS./KG72...	..KEEHO.J5...	415713N/0...	KEEHO	248.0	0.73575485	0.73575485	0.73575485	IFR	true
AAL1874	0		35000.0		35000.0	DFW	EWR	DFW./ROD...	..DJB.J29...	411909N/0...	DJB	254.0	0.75199115	0.75199115	0.75199115	IFR	true
BTA2208	0		35000.0		35000.0	MCI	EWR	MCI./ROD...	..DORET.J...	413051N/0...	DORET	249.0	0.73846704	0.73846704	0.73846704	IFR	true

- Selecting a single aircraft in the table will display its associated text in **bold** for reference.
- Its *callsign*, *route*, and *filedRoute* will be displayed in the respective text windows as shown.
- The *callsign*, *route*, and *filedRoute* can be edited from the upper windows without the need to do so in the individual table cells.
- The AC Table Editor has a search function that allows the user to search the entire file for specific callsigns, certain strings within a route/filedRoute, or strings within comment entries.

AC Table Editor: Column Headings



Each column has a fly-out menu that can be accessed by right clicking the column's heading cell.

Selecting each option will have the following results:

sort

Sorts the file in ascending order of the column's values.

bring errors to top

The editor has error checking for each field, with errors displayed in **red** text. Selecting this will bring all rows with errors in the selected column to the top.

Set column to editable

Changes made in other columns will not affect values in this column.

Set column to auto update

Changes made within an associated column will propagate to the column set to auto update. For example, setting the altitudeTarget or cruiseAltitude to 35000 will update the corresponding altitude cell to 35000.*

set selected ac to

Sets the column value of all selected aircraft to the text box entry.

*Updates will only propagate if the "Propagate Edits" checkbox is checked

AC Table Editor: Error Checking

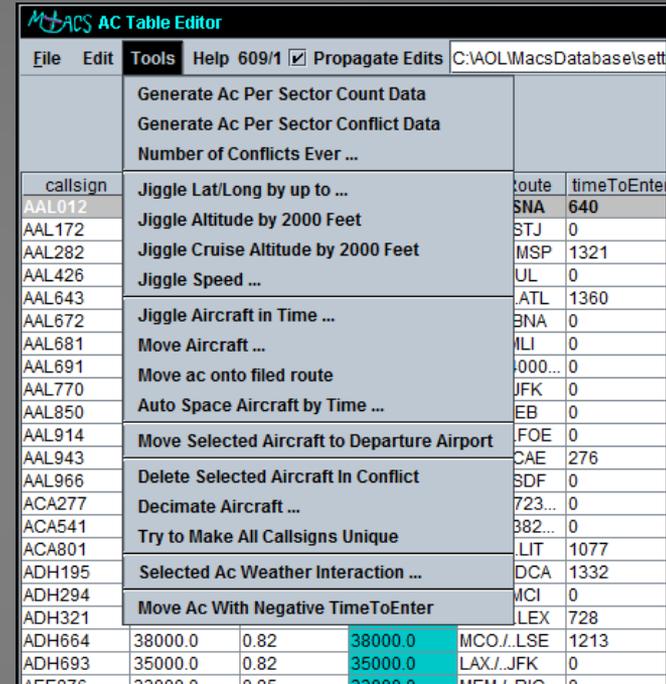
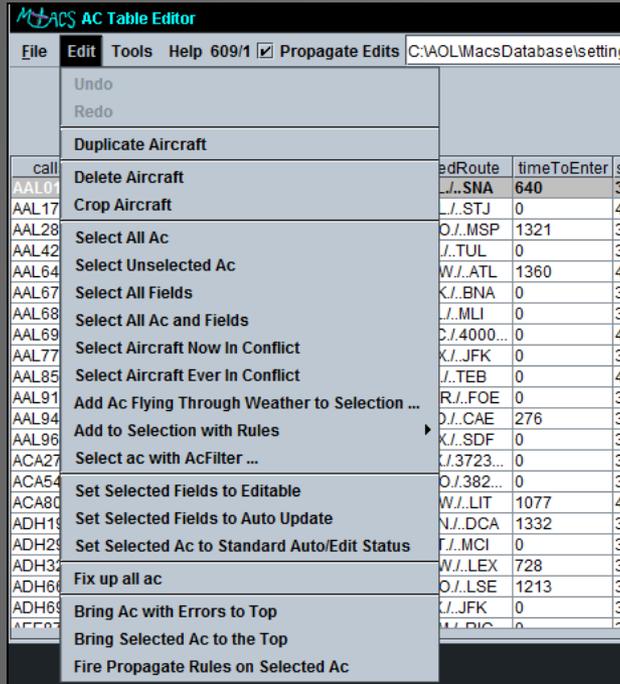
AWE758 Each aircraft with an error in any field has its callsign highlighted.

ORD./ADIME. Text in the field(s) containing errors are shown in red.

OOPS not found The filedRoute and route fields have tool tips displayed when hovered over that identify what is causing the specific error.

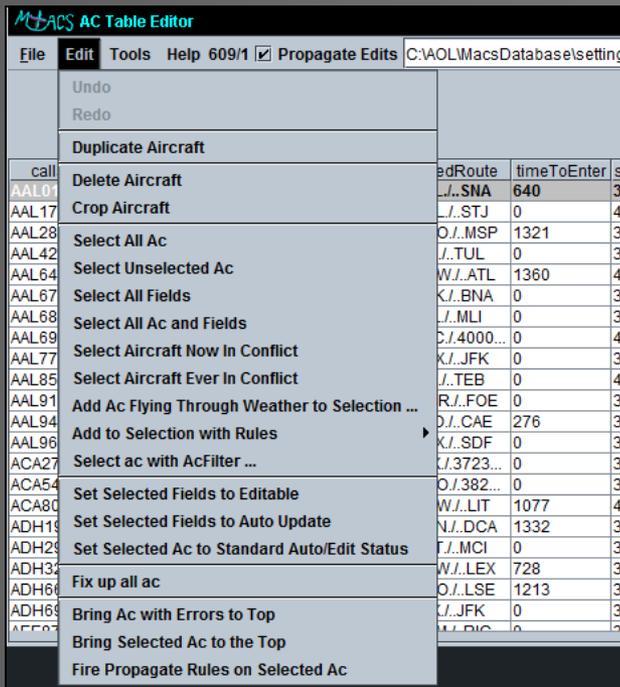
Fix Selected Fields Selecting this option from the flyout menu will “fix” the error. Exercise some caution when using this feature as some changes may not reflect your intent.

AC Table Editor Features



For the purposes of these slides, the Edit and Tools functions are too numerous to go into detail. It is recommended to simply try these out and get a feel for how the different options will best suit your needs. The following are a small selection of frequently used features in each of the menus.

AC Table Editor: Select Edit Functions



Undo
Redo

Undo returns to the previous state prior to the last change. Redo reincorporates the previous change.

Duplicate Aircraft

Makes exact duplicates of selected aircraft with the exception of new, unique callsigns. Can be performed on one or multiple selections.

Delete Aircraft

Removes the selected aircraft from the scenario file.

Crop Aircraft

Removes all non-selected aircraft. Only the selected aircraft remain following this action.

AC Table Editor: Select Tools Functions

MACS AC Table Editor					
File	Edit	Tools	Help	609/1 <input checked="" type="checkbox"/> Propagate Edits	C:\AOL\MacsDatabase\sett
		Generate Ac Per Sector Count Data			
		Generate Ac Per Sector Conflict Data			
		Number of Conflicts Ever ...			
callsign		Jiggle Lat/Long by up to ...	route	timeToEnter	
AAL012		Jiggle Altitude by 2000 Feet	SNA	640	
AAL172		Jiggle Cruise Altitude by 2000 Feet	STJ	0	
AAL282		Jiggle Speed ...	MSP	1321	
AAL426		Jiggle Aircraft in Time ...	UL	0	
AAL643		Move Aircraft ...	ATL	1360	
AAL672		Move ac onto filed route	BNA	0	
AAL681		Auto Space Aircraft by Time ...	ILI	0	
AAL691		Move Selected Aircraft to Departure Airport	000...	0	
AAL770		Delete Selected Aircraft In Conflict	JFK	0	
AAL850		Decimate Aircraft ...	EB	0	
AAL914		Try to Make All Callsigns Unique	FOE	0	
AAL943		Selected Ac Weather Interaction ...	CAE	276	
AAL966		Move Ac With Negative TimeToEnter	BDF	0	
ACA277			723...	0	
ACA541			382...	0	
ACA801			LIT	1077	
ADH195			DCA	1332	
ADH294			MCI	0	
ADH321			LEX	728	
ADH664	38000.0	0.82	38000.0	MCO/.LSE	1213
ADH693	35000.0	0.82	35000.0	LAX/.JFK	0
ADH778	32000.0	0.82	32000.0	MEM/.BIC	0

Generate Ac Per Sector Count Data

Displays the predicted sector load counts based on the traffic. Requires the **Load Graph Window** to be properly setup and displayed.

Move Aircraft ...

Activates a pop-up window through which an aircraft's position can be moved forward or backward along its route according to a specified time (in seconds).

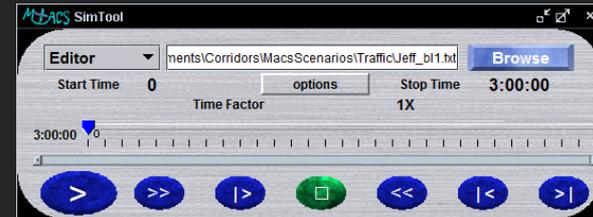
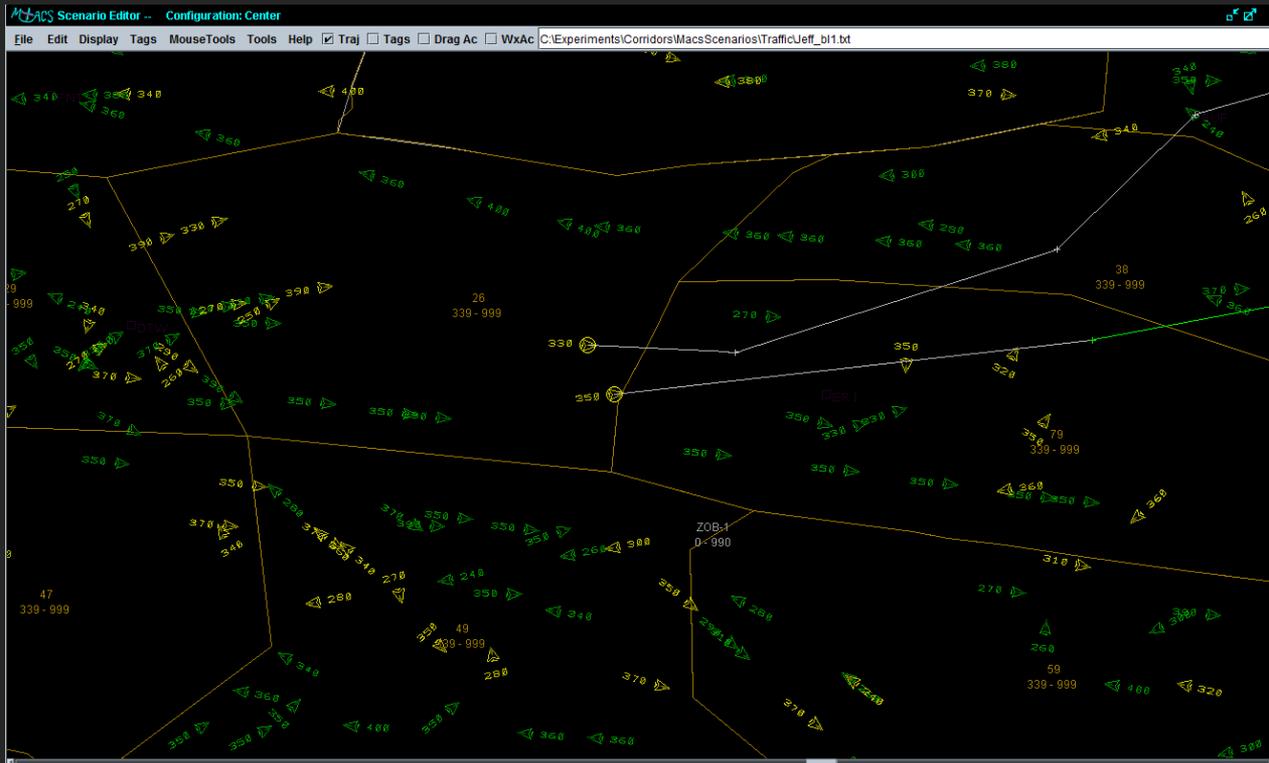
Move ac onto filed route

Occasionally changes can force an aircraft off of its route, which would mean it would be "free track" during the run. This feature attempts to place all selected aircraft back onto their route.

Decimate Aircraft ...

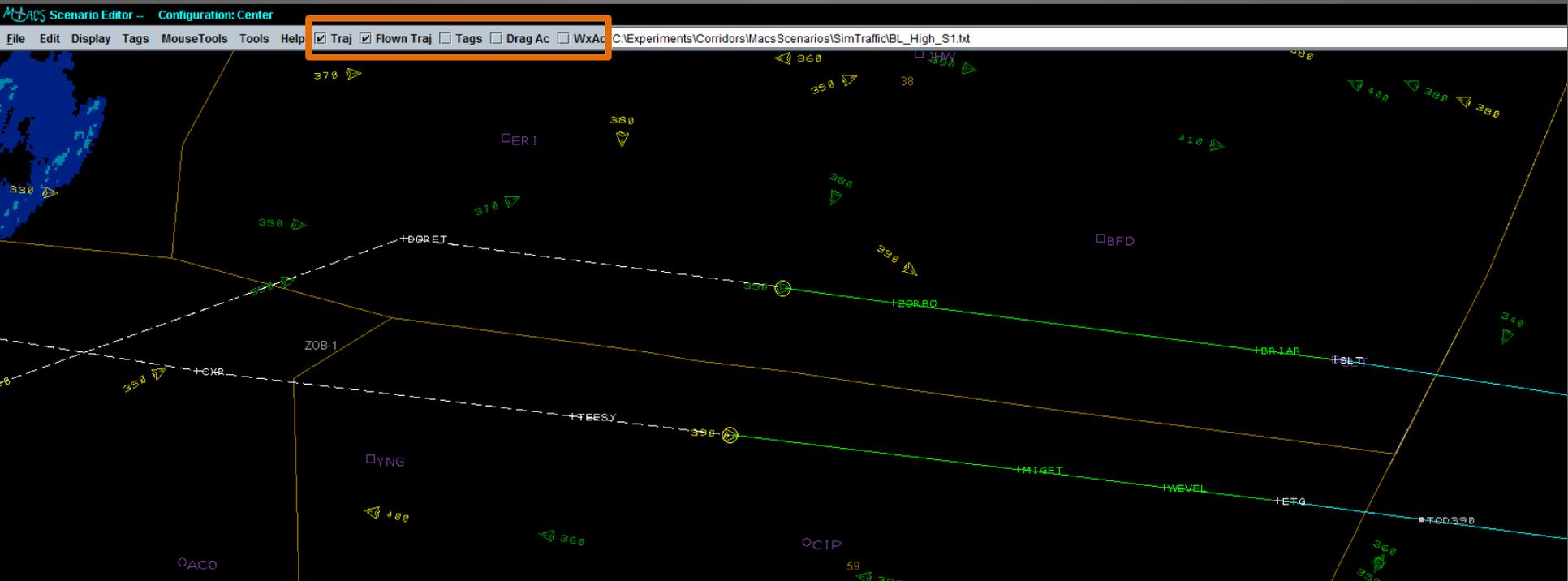
Activates a pop-up window through which the user can specify a percentage of the selected aircraft to remove from the file.

Scenario Editor



- The Scenario Editor allows the user to load and graphically manipulate aircraft within the file.
- It is often used in conjunction with the **SimTool**.
- Dragging the SimTool's time slider will update the aircraft positions to reflect their predicted positions at the given time.

Scenario Editor: Display



Traj Displays a solid line for the selected aircraft's trajectory to be flown from scenario start.

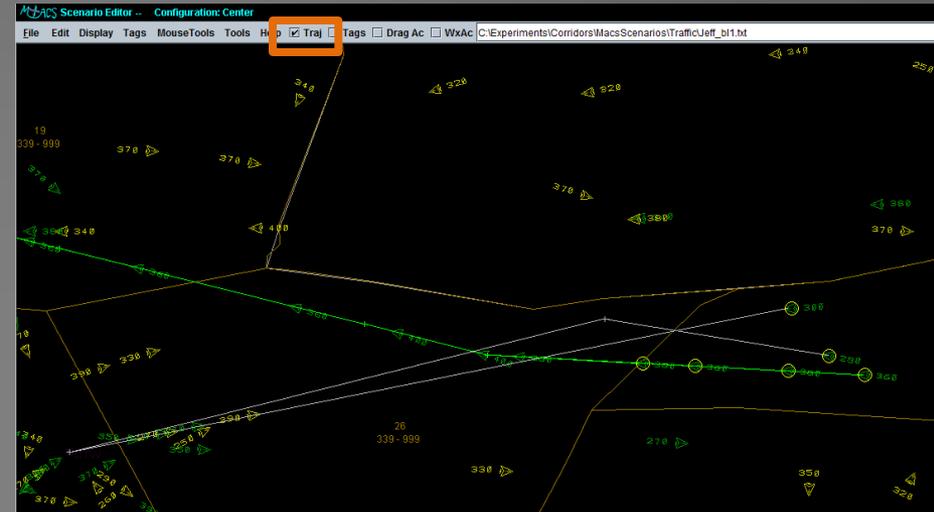
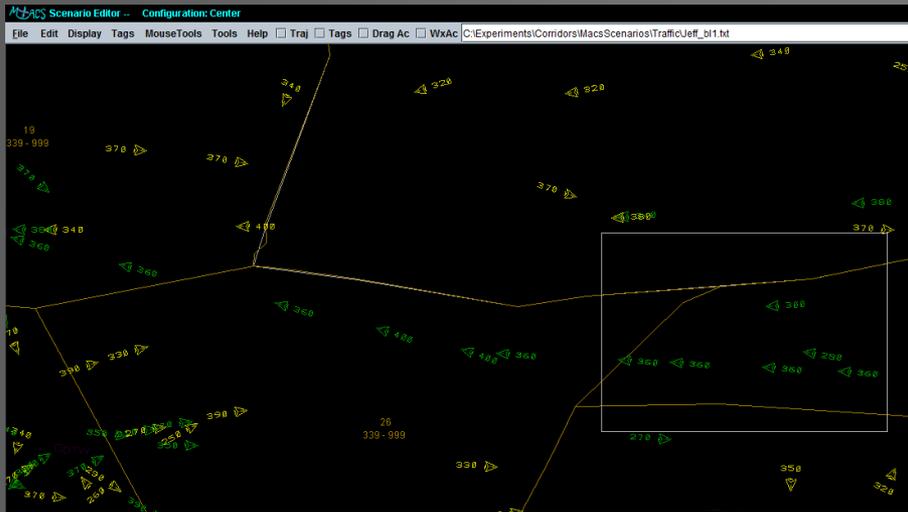
Flown Traj Displays a dashed line for the "flown" portion of the aircraft's trajectory.

Tags Displays the data tags for selected aircraft (dependent upon data tag rule settings).

Drag Ac Allows aircraft to be dragged anywhere, regardless of route. *Sets editor time to zero.*

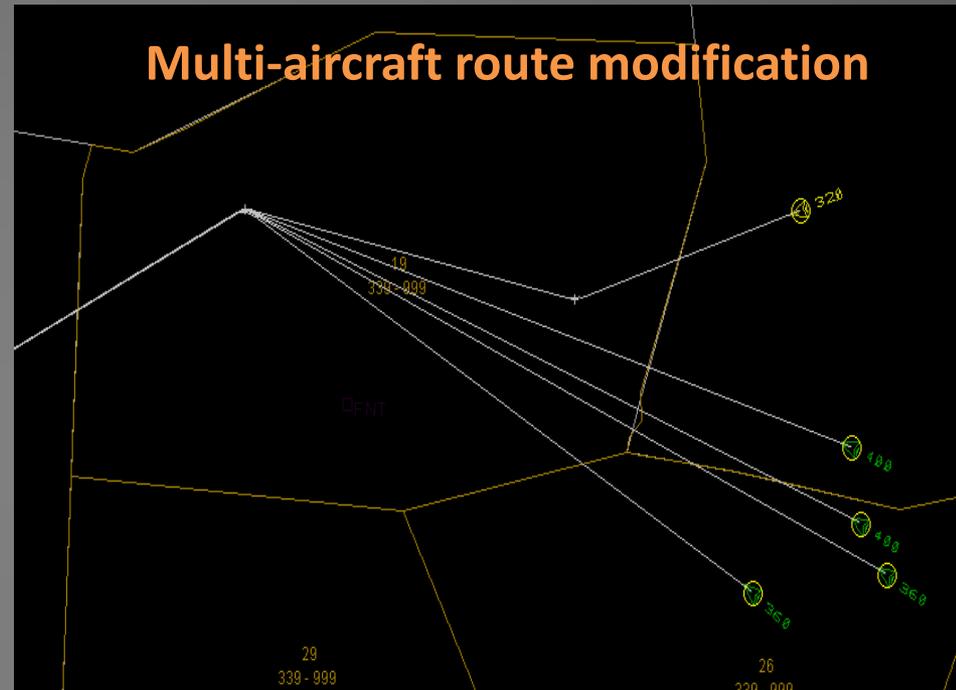
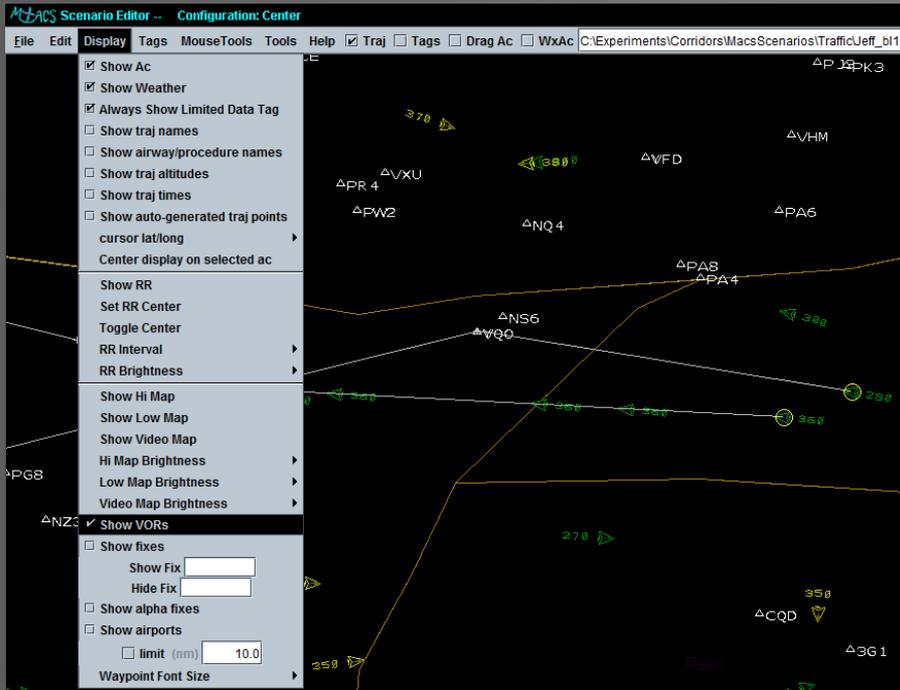
WxAc Displays the points at which an aircraft will penetrate convective weather.

Scenario Editor: Aircraft Selection



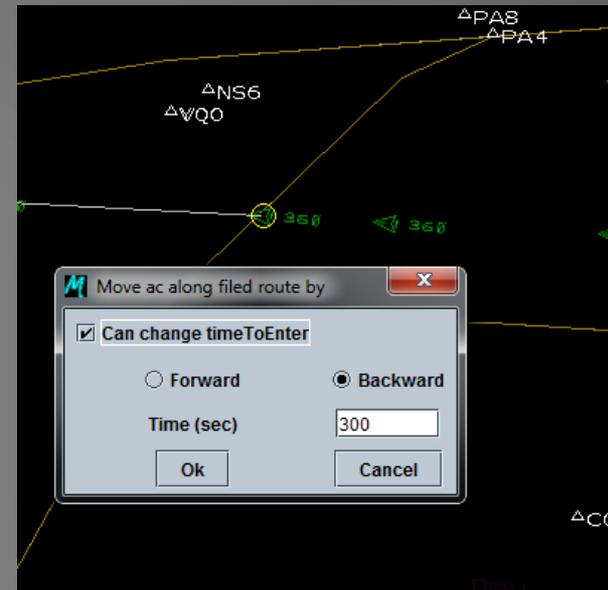
- Individual aircraft can be selected in the Scenario Editor by left-clicking on the target symbol.
- Multiple aircraft can be selected together by left-clicking and dragging a box around the desired aircraft (as shown on the left).
- To add aircraft to the selection, hold down the Shift key and left-click on the additional aircraft or draw another box.
- To remove aircraft from the selection, hold down the Shift key and left-click on the selected aircraft.
- Routes for selected aircraft can be displayed (see right panel) by selecting the **Traj** checkbox in the menu bar.

Scenario Editor: Route Modifications



- Aircraft routes can be modified by left-clicking anywhere along the route line and dragging the point to the desired location. Multiple routes can be modified by selecting overlapping/common points.
- If VORs or Fixes are not displayed, or if the point being moved is placed in an unnamed location, that point will be defined by a lat-long position.
- Dragging a point to a named location will snap it to the location and the name of the VOR or Fix will appear in the aircraft's route.
- To display named locations, check the *Show VORs* or *Show Fixes* boxes in the **Display** menu.
- To remove a point on the route simply right-click the point.

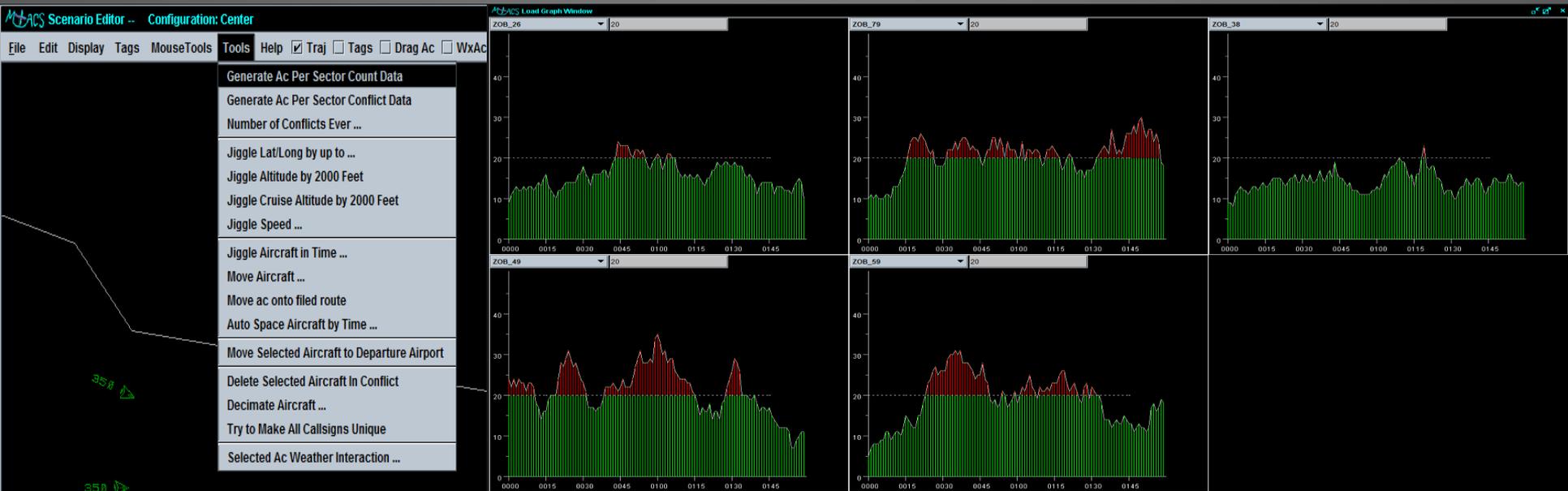
Scenario Editor: Aircraft Properties



- Right-clicking on an individual aircraft will open a flyout menu.
- The menu options displayed can be updated through additional menu options by dwelling the mouse pointer over the desired field.

- The position of one or more selected aircraft can be moved forward or backward along the route by navigating to the **Tools** menu and selecting *Move Aircraft...*
- The desired time and direction can be entered into the resulting window.
- A shortcut is to select the aircraft and then hit any number between 1-9 and it will move forward that number of seconds * 100 (e.g., 5 = 500 seconds). To move backward, hold the Ctrl key down while pressing the number.

Scenario Editor: Load Assessment



- The traffic loads for particular sectors can be viewed through the Load Graph Window.
- To display the window: in MACS' main menu bar navigate to **Windows** → **Analysis Views** → and select **Load Graph Window**.
- The sectors to view in the Load Graph and the specifications for the window must first be defined in the traffic load setup file.
- To view the loads, in the AC Table Editor or Scenario Editor select *Generate AC Per Sector Count Data* in the **Tools** dropdown menu as shown above.

Going Forward

- The preceding slides covered a small subset of the scenario development capabilities available in MACS.
- The best way to learn is to just try out the different tools and develop your own style and strategy.
- The scenario development tools are a work in progress. Let us know of serious errors that you uncover or any ideas for improvement that you may have.

Final Note

- Scenario development is an iterative process. Using the editing and development tools offline only gets you part of the way to the final product.
- It is critical to play the scenarios in Simulation mode, in real-time, in exactly the same way that the final study will be conducted. There are always differences that arise due to a variety of reasons that will only be noticeable when doing so.



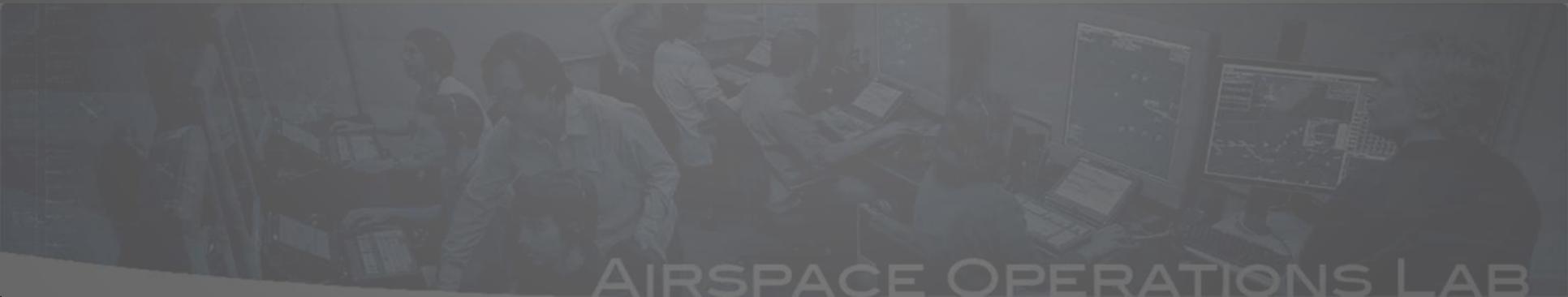
San José State
UNIVERSITY



Generating Convective Weather with the Convective Weather Editor

Jeff Homola

Slides by Matt Mainini



Outline

- What is the goal?
- What is the Convective Weather Editor?
- What are the capabilities and assumptions of the Weather Editor?
- What is the general process?
- Overview of Convective Weather Editor features

What is the goal?

The main goal of the Convective Weather Editor is to generate realistic convective weather to display on the DSR or TSD in which the operator may view and interact with.

What is the Convective Weather Editor?

The Convective Weather Editor is a tool within MACS that enables the user to sequentially combine convective weather images that appear as realistic weather formations in real time.

What are the capabilities and assumptions of the Weather Editor?

- Capabilities

- Generate realistic weather cells
- Multiple simultaneous weather cells
- Weather looping
- Predicted future weather
- Displayed on DSR and/or TSD
- Weather probe

- Assumptions

- Weather images have been prepared for MACS read-in
- The general location, size, direction, and number of cells have been considered

The process of generating MACS weather

- The basic process
 - Weather images are captured from NOAA
 - Images are prepared for MACS with Photoshop
 - Images are loaded in Convective Weather Editor window
 - Images, or “patterns,” are stitched together and edited in time, or “steps,” to create morphing convective weather cells, or “paths”
 - The “paths” are saved as an .xml and are played back as realistic weather cells on the DSR or TSD

Wx Color to Intensity Editor

Original gif image color

Undefined; this color must be changed to B, L, M, or H

Background; this color will be transparent

Low; this color will be whatever is set for low in DSR_1 PlanViewSetup

Medium; this color will be whatever is set for medium in DSR_1 PlanViewSetup

High; this color will be whatever is set for high in DSR_1 PlanViewSetup

Convective Weather Editor Window

The screenshot shows the Convective Weather Editor interface. On the left is a pattern list with columns for pattern number, name, size, and type. The main area is a grid of time slots with a path of weather patterns highlighted in blue. A central map shows a selected pattern with a color-to-intensity map. An 'Edit step' dialog box is open in the bottom right, showing parameters for a selected pattern.

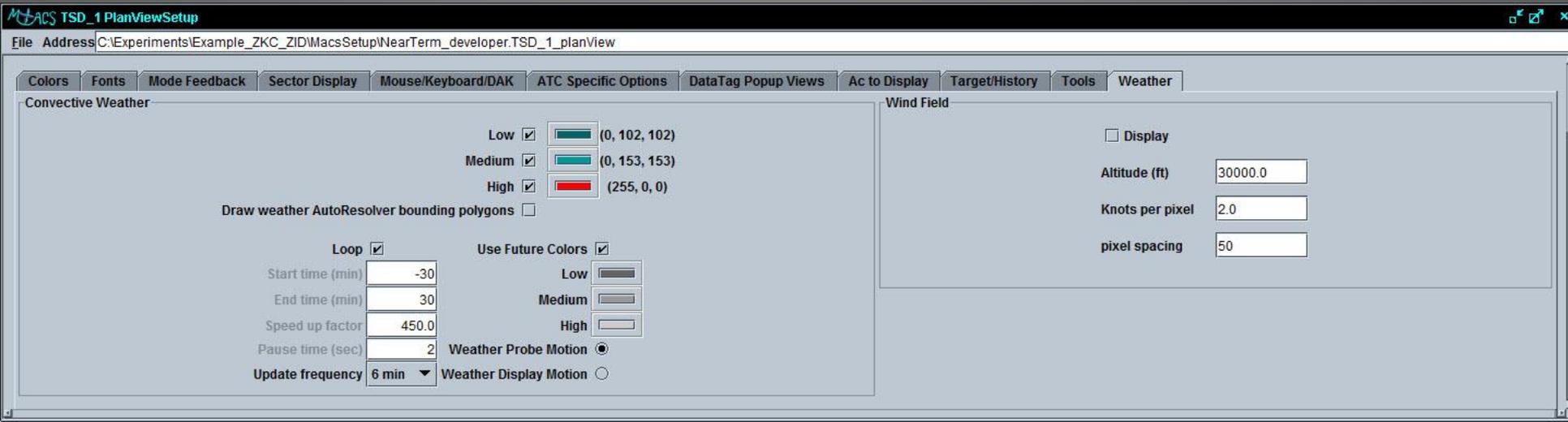
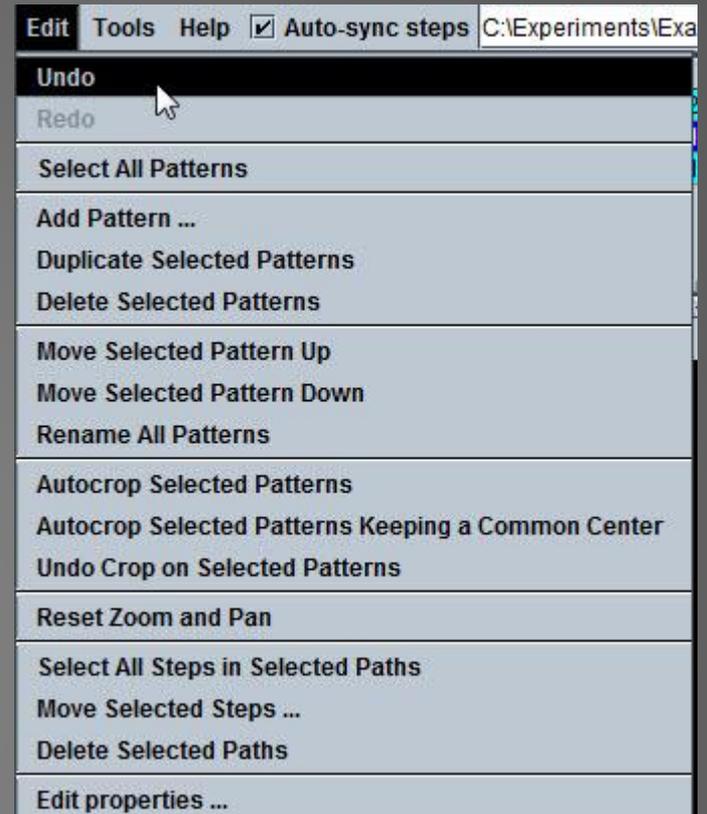
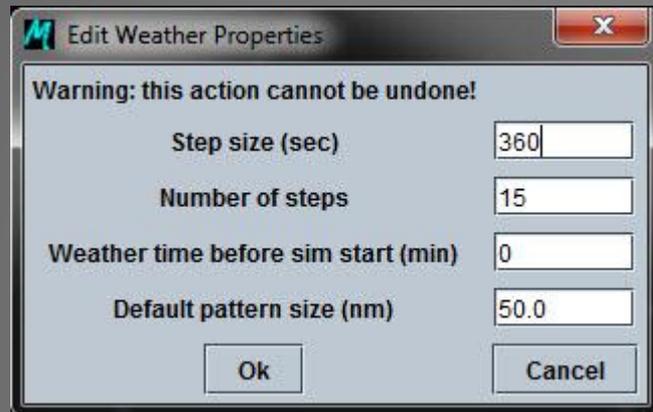
Callouts:

- Add and remove patterns, and other important functions**: Points to the top of the pattern list.
- Selected pattern name**: Points to the 'copy.gif' text in the pattern list.
- Color to Intensity Map group**: Points to the color-to-intensity map in the selected pattern.
- Size**: Points to the size input field in the pattern list.
- MACS generated number**: Points to the pattern number in the list.
- Path (the row of weather patterns)**: Points to the blue highlighted row in the time grid.
- Double click the cell to edit altitude, speed, heading, rotation, scale, shear**: Points to a cell in the time grid.
- 6 minute intervals**: Points to the time slots in the grid.
- Selected pattern**: Points to the map view of the selected pattern.
- Auto crop selected patterns keeping a common center**: Points to the map view.
- Hold shift to select multiple patterns**: Points to the pattern list.
- Zoom with mouse wheel
Rt. click and hold to pan**: Points to the map view.

Edit step dialog box parameters:

23	Rotation (degrees)	110.0	
Min altitude (ft)	1000	Scale X	1.0
Max altitude (ft)	50000	Scale y	1.0
Speed (knots)	11.782472	Shear X	0.0
Direction (heading)	148.07254	Shear y	0.0
Center X (nm)	1877319336	Center Y (nm)	1237060547

Other Important Menu Options



Contacts and References

Jeff Homola: jeffrey.r.homola@nasa.gov (650) 604-4603

Hwasoo Lee: hwasoo.lee@nasa.gov (650) 604-0764

Related guides on the MACS wiki:

Traffic generation:

<https://aol1.arc.nasa.gov:8443/display/macs/Scenario+Editor+User+Guide>

Convective weather generation:

<https://aol1.arc.nasa.gov:8443/display/macs/Weather+1+-+Overview+and+how+to+create+weather+patterns+to+be+loaded+in+MACS>

<https://aol1.arc.nasa.gov:8443/display/macs/Weather+2+-+How+to+Photoshop+weather+images+prior+to+MACS>

<https://aol1.arc.nasa.gov:8443/display/macs/Weather+3+-+How+to+use+the+MACS+Convective+Weather+Editor>